We claim:

1.   A method for saving power in a wireless communication network (400) including a plurality of devices (401ᵢ), comprising the steps of:

a device (401) announcing a sleep period in a beacon (600) of the device as an announcing device;

the announcing device (401) hibernating in a hibernation mode as a hibernating device (401) during the announced sleep period wherein the device (401) does not transmit a beacon (600) during the sleep period.

2.   The method of claim 1, wherein the announcing st ep further comprises the device (401) including a sleep period start time (303) and a sleep period duration (304) in the beacon.

3.   The method according to claim 1, further comprising the steps of:

the hibernating device (401) periodically waking up to listen for beacons (600) of other devices (401ᵢ); and

the hibernating device (401) returning to a hibernation mode if other devices (401ᵢ) have indicated no pending traffic for the hibernating device (401) in their beacons (600).

4.   The method of claim 1, further comprising the step of other devices (401ᵢ) than the hibernating device (401) keeping information on the presence of the beacon (600) of the hibernating device (401) in their beacons (600) during the announced sleep period of the hibernating device (401):

5.   The method of claim 1, further comprising the steps of:

another device (401ᵢ) including the address of the announcing device (401) in its beacon (600) in one of an information element (604) and field when the other device (401ᵢ) has pending data for delivery to the announcing device (401); and

the announcing device (401) staying in an active mode if a beacon (600) with one of an information element (604) and field including pending data for the announcing device (401) is received before the announcing device (401) performs the hibernating step.

6.   The method of claim 1, further comprising the steps of:

dividing time into a sequence of at least one superframe (100) having at least one beacon period;

grouping beacons of different devices into at the least one beacon period (101); and

defining a sleep period as a plurality of superframes (100).

7.   The method of claim 6, wherein the announcing step further comprises the device (401) including in the beacon hibernation information (300) comprising a sleep period start time (303) and a sleep period duration (304).

8.   The method of claim 7, wherein the including step further comprises the step of defining the sleep period start time (303) as a number of future superframes (100) relative to a current superframe (100).

9.   The method according to claim 8, wherein the defining step further comprises the step of transmitting the hibernation information in the beacon as a Hibernation Information Element (300) that includes at least the starting time (303) o f the sleep period and the duration (304) of the sleep period.

10.   The method of claim 6, further comprising the step of including hibernation information, further comprises the step of transmitting a Hibernation Information Element (300) in the beacon (600) that includes at least:

a starting time (303) of the sleep period;

a duration (304) of the sleep period; and

a periodicity of the sleep period, wherein the periodicity is a sum of a number of superframes that the device will be in a hibernation mode and a number of superframes the device will be in an active mode, wherein the active mode is defined as the device not being in the hibernation mode.

11.   The method of claim 1, further comprising the step of when a device (401) in an active mode has pending data to transmit to at least one intended receiver device (401ᵢ), it announces the pending data by including a Traffic Indication Map Information Element (351) in its beacon (600) that comprises at least the device addresses (353.i) of the at least one intended receiver device (401ᵢ) of the pending data.

12.   The method of claim 6, further comprising the steps of:

when in an active mode, the device (401) entering into a sleep state during a superframe(100) when there are no pending data transmissions for the device (401) that are announced in the beacons (600) of other devices(401ᵢ); and

the device (401) waking up from the sleep state at the beginning of each beacon period (101).

13.   The method of claim 6, further comprising the steps of:

when in an active mode, the device (401) entering into a sleep state during a superframe (100) when it has sent and received all data pending in the current superframe (100); and

the device (401) waking up from the sleep state at the beginning of each beacon period (101).

14.   The method of claim 6, further comprising the steps of:

when in an active mode, the device (401) entering into a sleep state during a superframe (100) when it is not involved in any of the transmissions that are announced in the beacons of other devices; and

the device (401) waking up from a sleep-mode at the beginning of its own beacon period (101), and at the beginning of beacon periods (101) in which it does not transmit its own beacon (600) when the device (401) has at least one active data s tream.

15.   A communications network (400) including a plurality of devices (401ᵢ) that save power by announcing hibernation in their beacon frames (600) by performing the power-saving method of claim 1.

16.   A wireless device (401) that saves power by entering at least one of a hibernation or sleep mode, comprising:

an antenna (507) for sending and receiving messages over a wireless medium (410);

a receiver (502) coupled to the antenna (507) to receive a message transmitted over the wireless medium (410);

a transmitter (506) coupled to the antenna (507) to transmit messages over the wireless medium (410);

a beacon processing module (504) to perform beacon processing for the device (401);

a processor (503) to divide time into a sequence of at least one superframe (100) having at least one beacon period (101) and operatively coupled to:

i.   the transmitter (506) and the receiver (502) to send and receive data and respectively send and receive beacon frames (600) announcing the intention of the device to hibernate and beacon frames (600) indicating that other devices (401$_i$) have pending data for the device (401),

ii.   the beacon processing module (504) to:

a.   process Hibernation Information Elements (300) of received beacon frames (600) of other devices (401$_i$) and maintain therefrom a hibernation table (509) of characteristics of the other devices (401$_i$);

b.   keep the device (401) in an active mode if a received beacon (600) announces pending data for the device (401);

c.   announce the intention of the device (401) to enter a hibernation mode at a start time (303) and for a sleep period (304); and

d.   periodically wake up the device (401) when the device (401) is hibernating to listen for beacons (600) of other devices (401$_i$) and to put the device (401) back into a hibernation mode if other devices (401$_i$) have indicated no pending traffic for the hibernating device (401) in their beacons (600).

he device of claim 16, wherein the processor (503) is further configured to:

when the device (401) is in an active mode, place the device (401) into a sleep state during a superframe (100) when there are no pending data transmissions for the device (401) announced in the received beacons (600) of other devices (401$_i$); and

wake up the device (401) from the sleep state at the beginning of each beacon period (101).

18. The device (401) of claim 16, wherein the processor (503) is further configured to:

when the device (401) is in an active mode, place the device (401) into a sleep state during a superframe (100) when the device (401) has sent and received all data pending in the current superframe (100); and

wake up the device (401) from the sleep state at the beginning of each beacon period (101).

19. The device (401) of claim 18, wherein the processor (503) is further configured to:

when the device (401) is in an active mode, place the device (401) into a sleep state during a superframe (100) when the device (401) is not involved in any of the transmissions that are announced in the beacons (600) of other devices (401$_i$); and

.when the device has at least one active data stream, wake up the device (401) from the sleep state at the beginning of:

     i.   its own beacon period (101) of the device (401); and

     ii.   beacon periods (101) in which the device (401) does not transmit its own beacon (600).